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Cerebral Dominance, a Matter for Elementary Teacher Awareness

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CEREBRAL DOMINANCE: A MATTER FOR ELEMENTARY TEACHER AWARENESS

by

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This research paper is dedicated to my husband Jerry, my children Laura and Joshua, and my parents Martha and Bob Green for the love, encouragement and patience they have given me while working on this project. Thank you.

Abstract

This study addresses areas in cerebral dominance theory which elementary classroom teachers should be aware of when developing instructional strategies to enhance the learning experiences of children. Presented are past and present findings on cerebral dominance theory, giving the reader some understanding of what has been found about the manner in which children process information. The characteristics and processes of the two halves of the cerebrum have been discussed and possible applications and misapplications of this information have been given. It is concluded that students process information in different ways and that the data can be useful when examining teaching techniques and learning styles. Some specific recommendations have been given to help teachers provide activities and instruction to develop both sides of the brain.

CHAPTER ONE

Introduction

Problem Statement

What should elementary classroom teachers know about cerebral dominance when developing instructional approaches to enhance the learning experiences of children?

Rationale

During the last few decades scientific developments have offered an important way of looking at learning--one that appears to have enormous potential for helping teachers bring about major gains in students' achievement.

It has been known for many years that the brain is the source for learning. It is appropriate for educators to consider the research of neuroscientists and to apply that research to education. The study of the brain is multidisciplinary, requiring many professional groups including educators to apply their expertise in exploring the potential and functions of the brain. This effort will someday reveal many answers to today's questions regarding the brain and help educators' understanding of the teaching--learning process.

Through hemispheric research, some understanding

has been gained concerning the manner in which people think, which can be of value to the classroom teacher (Grady, 1984).

In many classrooms, the teaching--learning methodology is based primarily on the linear, sequential, and analytic functions of the left hemisphere of the brain. An examination of the curriculum of many schools also shows that the curriculum is often weighted with subjects that stress the linear-sequential mode of reasoning. By having knowledge of, and intergrating the two sets of hemispheric functions, teachers can balance instruction, increase learning, and provide effective instructional techniques for more students (Grady, 1984).

What is required of students in the traditional elementary curriculum? Most instruction involves "teacher talk" while students listen. Verbal directions are given and the learner is required to complete a linear task. Students that learn in other ways are often overlooked using this style. Tregano (1982) explains that "In view of the traditional emphasis on left hemisphere learning in schools it is concluded that hands-on curriculum experiences providing children with the opportunity

to learn more right brain strategies would be beneficial" (p. 15).

The back-to-basics movement which stresses reading, writing, and arithmetic has often led to an overemphasis on learning activities that are dependent on left-hemisphere functions, leaving out right-hemisphere activities.

McCarthy (1980) states the following:

> The research findings on right and left brain functions are fascinating. No teacher or trainer can afford to ignore them. If you are a "traditional" teacher and your primary goal is to teach your students to think, you will be changed by these findings. If you are a "humanistic" teacher and your primary goal is to lead your students to their highest potential, you will be moved by these findings. (p. 69)

The main thrust of American education has been cognitively oriented. Beals (1981) argues that teachers should balance the curriculum to meet the needs of both kinds of learners. Hart (1978) claims that many teachers have found that the more approaches and materials they offer, the more students learn, especially in reading.

The individual learning styles of students can be enhanced through a variety of instructional strategies so that the students' knowledge of the content area is more meaningful. To meet the needs of educators and learners, formal schooling must stress all modes of consciousness.

Purpose

It is the purpose of this study to show elementary classroom teachers that they should be aware of the research on cerebral dominance in order that they may enhance the learning experience of children when developing instructional approaches.

CHAPTER TWO

Review of the Literature

The purpose of this study is to show elementary classroom teachers that they should be aware of the research on cerebral dominance when developing instructional approaches so that the learning experience of children will be enhanced. Teachers have traditionally lacked neurological training. With the existing areas of learning theories known to educators, combined with the findings on brain research, teachers' professional knowledge will increase.

The chapter will be organized into five major sections. Definitions are given in the first section to assist the reader in comprehending the following research. The second section will present past and present findings on cerebral dominance. The focus will be primarily on what has been happening in the field that is relevant to teachers. The third section will give characteristics of right and left brains. The possible applications of these findings, as they relate to the teaching of children, will be discussed in the fourth section. The final section will review contrasting viewpoints and problems dealing with the research.

Definitions

Right brain/Left brain. Seen from above, the human brain resembles the halves of a walnut connected at the center. These halves of the cerebrum specialize in a particular mode of consciousness, have unique characteristics, and can process information independently or together.

Cerebral dominance. At times, one hemisphere of the brain can be in control of processing information, one side can "take over". In many individuals there seems to be a hemispheric preference for specific functions.

Past and Present Findings in Brain Research

It has become popular for educators to refer to "right brain" or "left brain" thinking in many contexts. Today's attention to the different thinking styles associated with the two cerebral hemispheres has roots which reach back over a century.

As early as the 1860s and 1870s, brain specialists ascertained that damage to certain patients' left cerebral hemisphere resulted in a loss of language functions while damage to other patients' right cerebral hemispheres was associated with losses in visual-spatial recognition (Gray,

1980).

A. L. Wigan was one of the first to discuss the two hemispheres of the brain. Wigan discusses (cited in Grady, 1984) as far back as 1844 that the mind is essentially dual and that each cerebrum is a distinct and perfect whole as an organ of thought and that a distinct and separate process of thinking may be carried on in each cerebrum simultaneously.

This apparent dualism of the two halves of the brain or of the mind is referred to in the writings of John Dewey, Thomas Aquinas, Arnold Toynbee and others. Research studies by Michael Gazzaniga, Roger Sperry, Joseph Bogen and others clearly indicate that the human brain consists of two organs rather than one (cited in Crossett, 1983).

During the 1950s, Nobel Prize winner Dr. Roger Sperry began doing research on right and left brain functions. He conducted several animal studies in which the corpus callosum, the thick nerve cable connecting the two cerebral hemispheres, was severed. The animals were then given tasks with one side of their brain anesthetized. The results showed no great change in behavior. Their habits, gaits, and coordination remained unchanged following this drastic surgery (McCarthy, 1980).

The same type of surgery was performed during the 1960s on a limited number of human patients who had a history of intractable epilepsy (suffering seizures as many as 40 times a day). After the surgery, the attacks were controlled, they were fewer in number, the patient exhibited no outward disabilities, and were able to return to more normal lives. Sperry then began a battery of testing to find out what was going on in the two separate brain sections. This research led to three important findings:

1. The two halves of the brain process information differently.

2. In the split-brain patient, there are two people up there, each with his or her own likes and dislikes, and favorite ways of processing information.

3. Both hemispheres are equally important (McCarthy, 1980).

The left half of the brain is considered the verbal half and is dominant in approximately 98% of right-handed people and about two-thirds of left-handers. The remainder of the population, left-handers and ambidextrous individuals, are found to have their dominant hemisphere in either the right

or left side of the brain, and in a small number of cases appear to share the dominance between right and left sides of the brain (Chiaia & Teyler cited in Frank, 1984). The left brain does a lineal type of processing, a sequential type, while the right brain uses a global process in which data is perceived, absorbed and processed even while it is changing (Edwards, 1979).

According to Crossett (1983) it became apparent that each half-brain can think, remember, and learn on its own, as well as process information of which the other half is unaware. But, with the corpus collosum intact, these potentially independent spheres can work together to maintain unity.

Robert Ornstein and his colleague, David Galin (cited in Gray, 1980) explored the cerebral activity of "normal" right handed subjects. They believe that humans naturally alternate between the "left" and "right" thinking modes. They point out as an example that a person describing a spiral staircase may begin with clear statements from their left hemisphere, yet generally find themselves switching to their right hemisphere spatial images and lapsing into complex gestures before he or she finishes.

It is now widely recognized through research

that there are group differences in patterns of hemispheric specialization between right-handed and left-handed individuals and males and females. Typically the cerebral hemispheres of left-handed individuals and females are regarded as being more bilaterally organized than the hemispheres of right-handed individuals and males. Findings from studies also indicate that the foundations of hemispheric specialization are present very early in life (Levine cited in Frank, 1984).

Why is it that the majority of all populations, whether they are right or left handed, male or female has the language center in the left hemisphere and the spatial center in the right? Galin proposes (cited in Sinatra & Stahl-Gemake, 1983) that the answer lies in interhemispheric competition. Sinatra and Stahl-Gemake state that Corballis feels that the best explanation for right-hemisphere specialization in nonverbal functioning is that it was gained by default. It is interesting to note that, from the young child's point of view, each hemisphere has been reacting to the world with equal success until just about the start of formal schooling. Gazzaniga noted (cited in Sinatra & Stahl-Gemake) up to about the age of four, it seems that the right hemisphere

is as proficient in handling language as the left.

McCarthy (1980) states that the research indicates that rather than being a half-brained species, humans are a two-brained species, each having its special mind. Humans that have an intact corpus callosum preserve their sense of being a unified person by the melding of the two different kinds of perception.

Levine (cited in Frank, 1984) describes people as being whole-brained creatures, and that the integration of both cerebral hemispheres is required for even the simplest of tasks.

Characteristics of Right and Left Brains

According to Hopkins (1984) it is best not to reduce the left and right hemispheres of the brain into a simple division of two parts, with each hemisphere specializing in only one operation neatly contrasted to an opposite operation in the other hemisphere. Individuals are found to vary somewhat in their hemispheric specialization and the corpus callosum, if intact, integrates whatever processes taking place in them. Brain research suggests there are different intellectual processes specialized in by the two hemispheres. Given the research to date, the following comparisons seem

the most accurate.

The left hemisphere seems better at analyzing essentials, making direct relationships, and at sequential ordering. The left brain does verbal things, it likes sequence, it sees the trees. The left brain is structured.

The right hemisphere seems to be better at integrating parts into wholes and at simultaneous patterned thinking. The right brain does visual-spatial things, it likes random patterns, the right brain sees the forest. The right brain is fluid and spontaneous (McCarthy, 1980).

The left hemisphere, for most people, is the site of logical, analytical, linear, and propositional thought. It has primary control not only of the right side of the body but of such functions as talking, reading, writing, mathematical calculation, immediate verbal recall, time sense, order, and most activities involving linguistic and numeric processes.

The right hemisphere controls the left side of the body and perhaps more importantly it is the place of intuitive, imaginative, metaphoric, and holistic thinking. It controls dreaming, fantasizing, special perception, body awareness and

movement, tactile sensations, visual memory, and perhaps many of our emotions (Staley, 1980).

People who are left mode dominant are systematic. They solve problems by looking at the parts, and they are analytic. People who are right mode dominant see patterns. They solve problems by looking at the whole picture, and they are intuitive (McCarthy, 1980).

Applications of Hemispheric Specialization

Even though there are different intellectual processes specialized in the two halves of the brain, individuals differ greatly with regard to their hemispheric dominance and preference. In coping with and understanding their environments, some students have a preference for left brain functioning, some prefer right brain functioning, while others appear to have no hemispheric preference and are comfortable relying on either hemisphere (Staley, 1980).

The school world, unfortunately, is primarily a verbal, symbolic world, and there are many learners in that world who would prefer to learn in a more visual, nonverbal manner (Edwards, 1979). Many schools operate within a traditional teaching atmosphere and reach the left mode learners. The

right mode learners must either force themselves to fit into the left mode environment or they are left out. Often these are the children who fight, who are unorganized, show a lack of interest, become bored or display nonadaptive classroom behavior (Stellern, 1984).

Various balances should be considered when teaching children. A variety of instructional techniques will stimulate both hemispheres through the use of multiple processing systems of the brain. It is important to involve as many senses as possible when teaching so that each individual learner has an opportunity to perceive knowledge through his or her preferred learning style.

Grady (1980) feels that teachers need to determine the preferred mode of learning for each student and for themselves. This determination can usually be done through simple observations, or by using one of the many evaluation tools that have been developed.

Marly Witrock (cited in Gray, 1980) suggests that educators would improve teaching by:

> ...determining the child's preferred modality and then designing instructional strategies and materials which will directly challenge the

> preferred hemisphere first and provide secondary instructional experiences which will encourage the other hemisphere to participate in the activity. (p. 131)

Children need to be encouraged to make discoveries nonverbally using the right hemisphere and then verbalize their findings by using the left mode of thinking. By doing this, there will be less need to memorize information because students will know it in a more intuitive and deeper way and they will know the concept in both a verbal and nonverbal sense (Crossett, 1983).

According to Galin, (cited in Crossett, 1983) it is the responsibility of teachers to train both sides of the brain, to train students to use the cognitive style which is suited to the task at hand, and to train students to integrate the two hemispheres when dealing with a problem. The individual needs and potentialities of the student should be met to educate the "whole" child.

The applications of research on hemispheric dominance to educational practices can have educational implications, but it is important to remember that the study of cerebral dominance is a young science and there must be caution in applying

the research in the classroom.

Problems found in Cerebral Dominance Theory

Grady (1984) maintains that some people have accepted the theory of hemispheric dominance as a virtual panacea for the ills of education. He says many unsubstantial claims have been made about the functions of the two hemispheres. The data regarding differences between the two hemispheres, now supported by much research does have important implications for the teaching-learning process. He states that one should be cautious about the increased knowledge about the brain.

Grady (1984) stated the following:

> We do not simply have the power to increase learning. We also have the power to control the mental development of others. In time, it appears, we will know how to program the brain to do or think as we believe it should. Scientists who know how the brain works will have the potential to control the minds of others. (p. 10)

With this increased knowledge, this could raise new ethical and moral questions.

Gray (1980) reminds teachers that there are contradictions which are typical of a young field of

scientific study and that this should warn educators against making hasty conclusions and implementing half-baked changes in educational techniques.

Gray (1980) states the following:

> It is important to remember the basic fact that individual thinking styles vary in response to any particular task, for this individuality is easily forgotten in the face of the intriguing data about what kind of brain functioning tends to be stimulated by what kind of task.
>
> (pp. 130-131)

Sandoval and Haapmanen (1981) imply that there is controversy concerning what hemispheric specialization or lateralization actually means. One must distinguish between memory and processing of new information, when considering what types of functions are lateralized in the cerebral hemispheres.

Fadely and Hosler (1983) state that the present trend is toward focusing on the stimulation of high function and the creative aspects of the child's development and that it is shortsighted and does not utilize the more valuable aspects of what has been learned about cerebral research. It is common today for educators to call a child a certain type

of learner when he or she is, in fact, almost always both. It is the integration of hemispheric function that provides the key to understanding how a child learns. Hemispheric theory should not be simply another trick in a teachers teaching bag, as it is becoming.

The most important element in hemispheric theory is to come to understand how the child "thinks", to understand how he "solves" problems, "creates" ideas, and learns to communicate with people.

Summary

Research on hemispheric theory has been reviewed giving the reader some understanding concerning the manner in which children think. These researchers have determined that the two halves of the cerebrum, while seemingly alike, have unique characteristics. The right hemisphere controls the motor and sensory operations on the left side of the body and the left hemisphere controls the same operations on the right. Each hemisphere specializes in a particular mode of consciousness. Because schools tend to stress left-hemisphere dominance, teachers need to be aware

of all students' modes of learning. Applications and misapplications have been given. As brain processes are gradually understood teachers will be able to profit from these discoveries to the benefit of the student.

CHAPTER THREE

Conclusions and Recommendations

The purpose of this study is to provide a base of knowledge on cerebral dominance research so that elementary classroom teachers will be able to enhance the learning experience of children when developing instructional approaches.

Conclusions

Brain researchers are providing a data base on how the brain works and functions. The research has shown that the two halves of the brain have unique characteristics and that each half processes information differently. Based on the research it appears that some "normal" children perform tasks associated with the left hemisphere better than they perform tasks associated with the right hemisphere. Others perform tasks associated with the right hemisphere processes better than they perform tasks associated with the left. However, both the left and the right hemispheres of the brain are involved in higher cognitive functions and generally operate in a complimentary fashion. The integration of both sets of hemispheric functions will help balance instructions, and provide effective instructional techniques for more students.

Teachers should be aware of the research findings but not think of them as the "cure" to all of children's learning problems. The data can be helpful when examining teaching techniques and learning styles. Research suggests that both the left and right hemispheres are in need of total development.

Recommendation

Student's individual learning styles can be enhanced through a variety of instructional strategies. The following suggestions will help elementary classroom teachers develop both visual and verbal thought processes in their students.

1. Children need not be labeled as having only one learning-thinking style. They will receive a better education when the teacher balances instructional strategies.

2. Give directions both visually and verbally.

3. Allow manipulative forms of learning.

4. Allow students time to "picture" concepts visually before verbally answering questions.

5. Allow time for creative problem solving.

6. Allow students to illustrate ideas.

7. Allow students to express ideas in words.

8. Stimulate on some occasions one hemisphere

only, thus expanding thinking in the nonpreferred mode.

9. Provide opportunities for experimental learning.

10. Provide opportunities involving fantasy.

11. Include more opportunities for expression in art, drama, body movement, and music.

12. Strive for holistic thinking that encourages students to use a variety of thinking skills to comprehend content and to solve problems.

This writer recommends a balanced and integrated approach that utilizes both modes of consciousness.

Summary

This study discussed areas in cerebral dominance theory, in which elementary classroom teachers should be aware of in developing instructional strategies to enhance the learning experience of children. Past and present research has been reviewed, giving the reader some understanding of what has been found about the manner in which children process information. The characteristics and processes of the two halves of the cerebrum have been discusses and it has been shown that children vary in their preferred modes of learning. Teachers should be aware of the

research before applying cerebral dominance theory in the teaching-learning environment. Cautions and problems with some of the research and applications of the theory are given. The study provides some conclusions and recommendations for the elementary classroom teacher. As brain processes are gradually understood, teachers should keep abreast of current research so that they will be able to profit from the findings to the benefit of the student.

References

Beals, M. G. (1981). The right brain: An emerging frontier in education (Report No. SP019388) Tulsa, OK: Paper presented at the Annual Symposium "Education and Contempory America". (ERIC Document Reproduction Service No. ED 211 518)

Chiaia, N. & Teyler, T. J. (1984). Higher brain functions. In M. Franks (Ed.), A child's brain (pp. 45-75). New York: The Haworth Press.

Crossett, B. (1983). Using both halves of the brain to teach the whole child. Social Education, 47, 266-268.

Edwards, B. (1979). Drawing on the right side of the brain. Los Angeles: J. P. Tarcher.

Fadely, J. L. & Hosler, V. N. (1983). Case studies in left and right hemispheric functioning. Springfield, IL: Thomas.

Grady, M. (1984). Teaching and brain research: Guidelines for the classroom. New York: Longman.

Gray, E. (1980). Brain hemispheres and thinking styles. Clearing House, 54, 127-132.

Haapmanen, R. N. & Sandoval, J. (1981). A critical commentary on neuropsychology in the schools: Are we ready? School Psychology Review, 10, 381-388.

Hart, L. (1978). Brain-compatible teaching. Today's Education, 67 (4), 42-45.

Hopkins, R. L. (1984). Educating the right brain: Why we need to teach patterning. Clearing House, 58, 132-134.

Levine, S. C. (1984). Hemispheric specialization and functional plasticity during development. In M. Franks (Ed.), A child's brain (pp. 77-93). New York: The Haworth Press.

McCarthy, B. (1980). The 4mat system. Arlington Heights, IL: Excel.

Sinatra, R. & Stahl-Gemake, J. (1983). Using the right brain in the language arts. Springfield, IL: Thomas.

Staley, F. A. (1980). Hemispheric brain research: A breakthrough for outdoor education. Journal of Physical Education and Recreation, 51 (4), 63-64.

Stellern, J. and others (1984). Cognitive mode and classroom behavior. Psychology in the Schools, 21, 103-111.

Tregano, D. W. (1982). Assessment of hemispheric dominance for language at three ages (Report No. PSO12835). Boise, ID: Paper presented at the Annual Conference of the Southern Association for Children Under Six. (ERIC Document Reproduction Service

No. ED 220 177)